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JUN 19 2003  
GROUP 1700

# REMARKS

Pursuant to 37 CFR § 1.121, a "VERSION WITH MARKINGS TO SHOW CHANGES MADE" is enclosed following these remarks.

Claims 1-33 are pending and stand rejected. This communication amends claims 1, 16, 21, and 23-28.

In response to the objection to claim 16, the same has been amended to eliminate the recitation of "which from the feedstock powder". Accordingly, withdrawal of this objection is respectfully requested.

It is noted that the abstract is missing from the application. According to the applicants' records, a copy of the International Application was communicated to the United States Patent Office by the International Bureau. The International Application included an abstract. In the interest of being responsive to the Office Action, a copy of the abstract on a separate sheet is included herewith.

It is noted that paragraphs 3 and 4 of the Office Action discuss statutory double patenting under 35 USC 101. However, no claims have been rejected under statutory double patenting in the Office Action. Therefore, no further response is necessary regarding paragraphs 3 and 4.

Claims 21-28 appear to stand objected to under 37 CFR 1.75 as being a substantial duplicate of claims 6-12 and 15 because claims 21-28 depend directly or indirectly from claim 1. This objection is not understood as claims 21 and 23-28 were amended to depend from claim 16 during Phase II of the PCT. (Claims 9 and 24 were also canceled during this Phase.) In the interest of being responsive to the Office Action, claims 21 and 23-28 have been amended herein to depend from claim 16. Clarification of the claims under examination is respectfully requested.

Claims 16-27 stand rejected under 35 USC 102(b) as being anticipated by US Patent 5120693 to Connolly *et al.* (Connolly).

Claim 16 is representative of the claims grouped in this rejection and is directed to a method of making a feedstock powder for use in producing thermal spray abrasion resistant coatings composed of a ceramic/metal material system or a ceramic/ceramic material system. Of particular note in claim 16 is the step of "aggregating the powder mixture to bond the nano-scale particles to the micron-scale particles thereby forming particle aggregates". Page 6 of applicants' specification defines aggregated particles as "clusters of bonded together particles that cannot be easily separated from one another by mechanical means". Page 7 of applicants' specification states that "Agglomerated particles differ from aggregated particles in that they are capable of being mechanically separated from one another."

In contrast, Connolly describes a method of making silica-bonded spray dried agglomerates of molecular sieves which are used for eliminating odors. Connolly does not expressly or inherently describe the aggregating step of claim 16 because Connolly does not make aggregated particles. Moreover, the method described in column 5, lines 27-48 of

Connolly does not expressly or inherently describe an aggregating step wherein nano-scale particles are bound to the micron-scale particles such that the bound particles cannot be easily separated from one another by mechanical means, as in the present invention.

In view of the foregoing, withdrawal of the 35 USC 102(b) rejection using Connolly is respectfully requested.

Claims 1-15 and 28-33 stand rejected under 35 USC 103(a) as being unpatentable over Connolly in view of WO 97/18341 (the '341 document).

Re claims 1-15:

Claim 1 is representative of claims 1-15 and is directed to a method for producing an abrasion resistant coating composed of a ceramic/metal material system or a ceramic/ceramic material system. Of particular note in claim 1 is the step of "aggregating of the powder mixture to bond the nano-scale particles to the micron-scale particles thereby forming a feedstock powder comprised of aggregated particles", and the step of "thermal spraying the feedstock powder of particle aggregates onto a substrate thereby forming the abrasion resistant coating thereon, the coating composed of the micron-scale particles of the hard phase material fused together with the binder phase material".

Connolly does not teach or suggest either one of these steps. As argued earlier, Connolly does not teach or suggest the aggregating step because Connolly does not make aggregated particles. Moreover, the method described in column 5, lines 27-48 of Connolly does not expressly or inherently describe an aggregating step wherein nano-scale particles are bound to the micron-scale particles such that the bound particles cannot be easily separated from one

another by mechanical means, as in the present invention. The Office action admits that Connolly does not teach or suggest the thermal spraying step.

The '341 document fails to cure the deficiencies of the Connolly patent as it merely teaches the thermal spraying of nanostructured powder feeds. Accordingly, Connolly in view of the '341 document fail arrive at the subject matter of claim 1.

Claims 28-33:

Claim 28 has been amended to depend from claim 16, therefore, the arguments set forth above against the applicability of Connolly to claim 16, apply equally to claim 28.

Claim 29 is representative of claims 29-33 and is directed to an abrasion resistant coating. Of particular note in claim 29 is the limitation "micron-scale particles of a hard phase material fused together with the binder phase material". Connolly in view of the '341 document fail to teach or suggest this limitation because they merely teach agglomerated powders. These agglomerated powders do not contain micron-scale hard phase particles that are fused with nano-scale binder phase particles as called for in claim 29.

In view of the foregoing, withdrawal of the 35 USC 103(a) rejection using Connolly in view of the '341 document is respectfully requested.

Favorable reconsideration of this application is respectfully requested as it is believed that all outstanding issues have been addressed herein and, further, that claims 1-33 are in condition for allowance, early notification of which is earnestly solicited. Should there be any questions or there matters whose resolution may be advanced by a telephone call, the examiner is cordially invited to contact applicants' undersigned attorney at his number listed below.

No fee is believed to be due on account of the enclosed communication. The Commissioner is hereby authorized to charge any other fees which may be required or credit any overpayment to Deposit Account No. 50-2061.

Respectfully submitted,



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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

The following marked-up paragraph and claims correspond to the replacement paragraph and claims of this amendment.

On page 1, the section entitled "RELATED U.S. APPLICATIONS" and the paragraph under same:

### [RELATED APPLICATIONS]

This application claims the benefit of Provisional Application No. 60/149,128 filed on August 16, 1999.]

This application is a National Stage of International Application No. PCT/US00/22340, filed on August 16, 2000, published in English, which claims the benefit of U.S. Provisional Application No. 60/149,128 filed on August 16, 1999.

1.(AMENDED) A method for producing an abrasion resistant coating composed of a ceramic/metal material system or a ceramic/ceramic material system, the method comprising the steps of:

blending micron-scale particles of a hard phase material with nano-scale particles of a binder phase material to form a uniform powder mixture;

aggregating [of] the powder mixture to bond the nano-scale particles to the micron-scale particles thereby forming a feedstock powder comprised of aggregated particles; and

thermal spraying the feedstock powder of particle aggregates onto a substrate thereby forming the abrasion resistant coating thereon, the coating composed of the micron-scale particles of the hard phase material fused together with the binder phase material.

16.(AMENDED) A method of making a feedstock powder for use in producing thermal spray abrasion resistant coatings composed of a ceramic/metal material system or a ceramic/ceramic material system, the method comprising the steps of:

blending micron-scale particles of a hard phase material with [a] nano-scale particles of a binder phase material to form a uniform powder mixture; and

aggregating [of] the powder mixture to bond the nano-scale particles to the micron-scale particles thereby forming particle aggregates [which from the feedstock powder].

21.(AMENDED) The method according to claim [1] 16, further comprising the step of agglomerating the powder mixture formed in the blending step prior performing the aggregating step.

23.(AMENDED) The method according to claim [1] 16, wherein the hard phase material includes one of a ceramic or a ceramic/metal composite.

24.(AMENDED) The method according to claim [1] 16, wherein the binder phase material includes one of a metal, ceramic and ceramic/metal composite.

25.(AMENDED) The method according to claim [1] 16, wherein the micron-scale particles of the hard phase material comprises between 50 and 90 volume percent of the blended powder mixture.

26.(AMENDED) The method according to claim [1] 16, wherein the micron-scale particles of the hard phase material comprises 70 volume percent of the blended powder mixture.

27.(AMENDED) The method according to claim [1] 16, wherein the aggregating step is performed by heat treating.

28.(AMENDED) The method according to claim [1] 16, wherein the ceramic/metal material system is selected from the group consisting of WC/Co, Cr<sub>3</sub>C<sub>2</sub>/NiCr, TiC/Fe, metal boride/metal, and metal nitride/metal and the ceramic/ceramic material system is selected from the group consisting of Al<sub>2</sub>O<sub>3</sub>, YSZ, Al<sub>2</sub>O<sub>3</sub>/TiO<sub>2</sub>, ZrO<sub>2</sub>/MgO, and Cr<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub>.